Surveillance for Foodborne and Diarrheal Diseases: Integration of Environmental Inspection and Testing

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A Plethora of Current Surveillance Systems

Foodborne and Diarrheal Diseases National Case Surveillance Systems

- National Notifiable Diseases Surveillance System (NNDSS)
  - Reports via the National Electronic Telecommunications System for Surveillance (NETSS)
- Public Health Laboratory Information System (PHLIS)

Diseases Under Surveillance

National Notifiable Diseases Surveillance System

- Botulism
- Enterohemorrhagic *E. coli* (EHEC) infection
- Hemolytic Uremic Syndrome (HUS)
- Listeriosis
- Salmonellosis
- Shigellosis
- Cholera
- Typhoid fever
- Campylobacteriosis, Yersiniosis

Pathogens Under Surveillance
Public Health Laboratory Information System

- *Campylobacter* spp.
- Shiga toxin-producing *E. coli*
- *Salmonella* Serotypes
- *Shigella* spp.
- *Vibrio* spp.

Public Health Laboratory Information System

- **Established to collect pathogen subtype information from public health laboratories**

- **Started with *Salmonella* serotypes, now collects information on a large number of pathogens**

Importance of Subtype Information
Salmonella

- Common cause of Foodborne disease
- Over 2000 serotypes
- Serotypes have individual biology and epidemiology
  - *S.* Typhi - Typoid fever
  - *S.* Enteritidis - Egg associated
  - *S.* Typhimurium - Cattle associated

Additional Disease Surveillance Systems

- Botulism
- Cholera
- Typhoid

FDDB Administered Surveillance

- Many more variables used for clinical, laboratory and epidemiologic characterization
- Confirmation of cases with reporting health departments
- Includes variables to assess How? and Why?

Foodborne Outbreak Surveillance

- Electronic Foodborne Outbreak Reporting System
- *Salmonella* Enteritidis outbreaks
- *E. coli* O157 outbreaks

Foodborne and Diarrheal Diseases Sentinel Surveillance Systems

- **Foodborne Diseases Active Surveillance Network (FoodNet)**
  - **10 states or parts of states**

- **National Antimicrobial Resistance Monitoring System- Enteric Bacteria (NARMS)**
  - **50 states**


PulseNet
The National Molecular Subtyping Network for Foodborne Disease Surveillance
WASHINGTON
OR
OREGON
CA
CALIFORNIA
L.A. County
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
CO
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
MN
IOWA
MISSOURI
ARKANSAS
LA
WISCONSIN
ILLINOIS
MICHIGAN
IN
OHIO
KENTUCKY
TN
MS
ALABAMA
GA
FL
SO. CAROLINA
NO. CAROLINA
VIRGINIA
WV
PENNSYLVANIA
NEW YORK
NY
MAINE
VT
NH
MA
CT
RI
NJ
DE
MD
DC
N.Y. City
CDC
ALASKA
HAWAII
Area Laborat
National Patte
Database and
Coordination
ea Laboratories:
Washington
Utah
Texas
Minnesota
Michigan
CDC
Virginia
Massachuset
Future PulseNet Participant
USDA-FSIS Laboratory
US Food and Drug Administration
FDA-CVM Laboratory
FoodNet Participant

PulseNet

- Network of foodborne diseases genotyping laboratories
- Determine, share and submit genotype patterns for bacterial foodborne pathogens
- Serves to identify outbreaks by detecting genotype clusters among isolate
- Serves to define outbreaks by inclusion or exclusion of related isolates

Limitations to Current Surveillance Systems

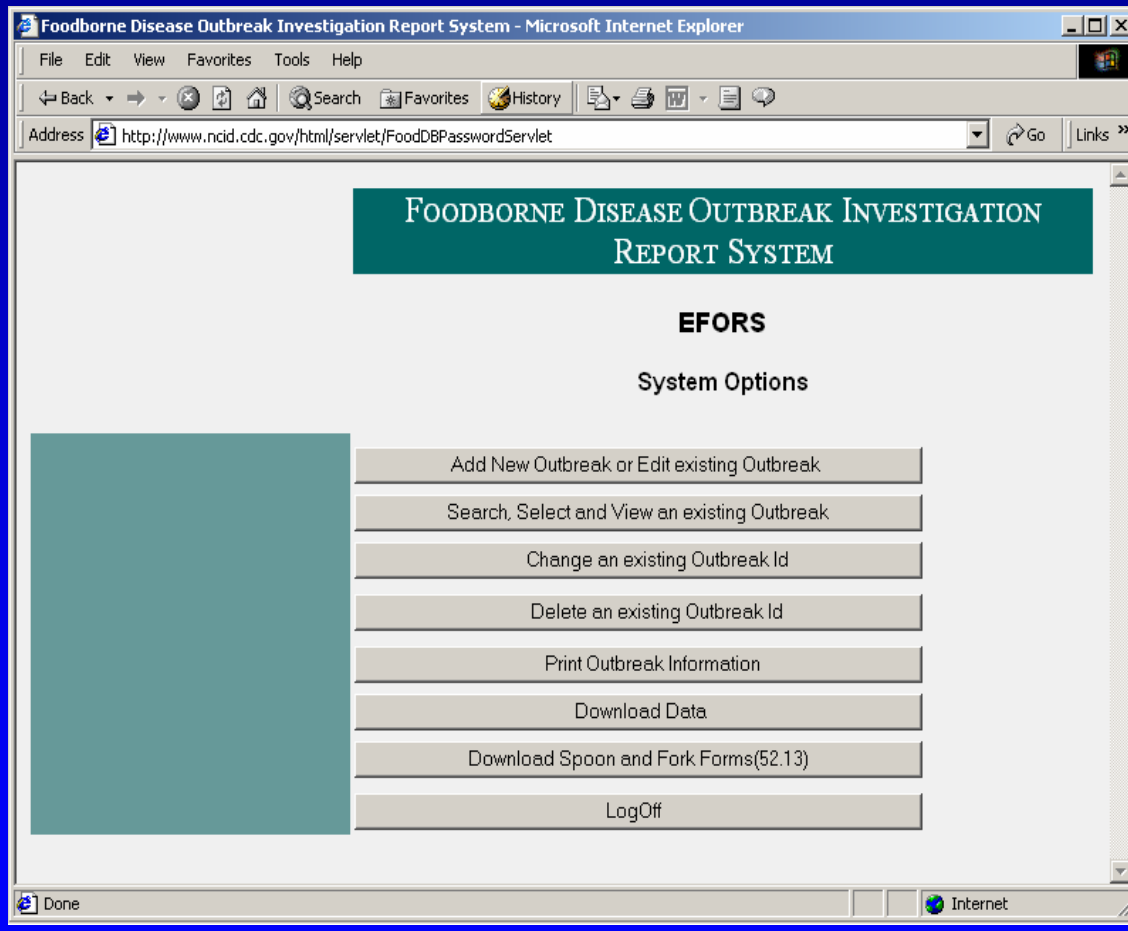
- Proliferation of duplicative and incompatible systems
- No direct link between laboratory and epidemiologic data for case surveillance
- Captures little environmental inspection and testing data

Integrating Environmental Data

The Farm to Doctor Continuum

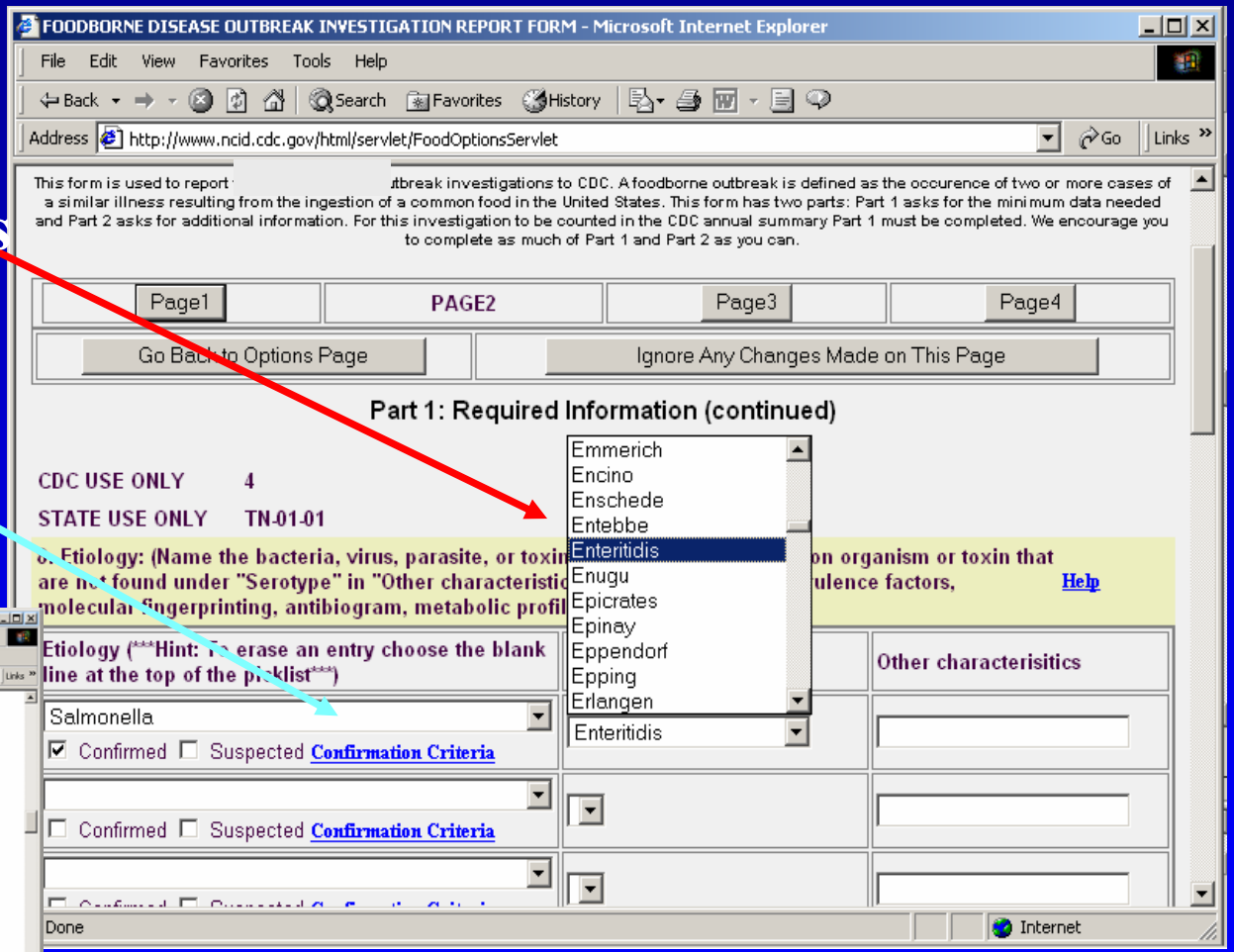
Electronic Foodborne Outbreak Reporting System (EFORS)

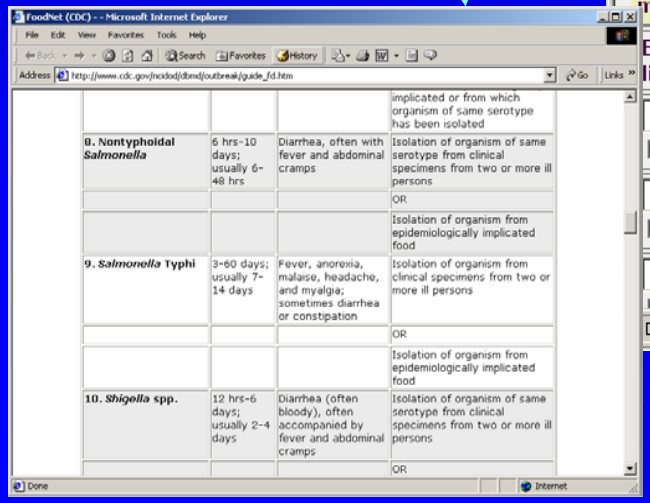
- Active at federal level
- Linelists published on web
- Electronic reporting (EFORS)
- NEDSS compliant



Electronic Foodborne Outbreak Reporting System (EFORS)

- Pathogen lists with serotype, genotype
- Links to ref materials





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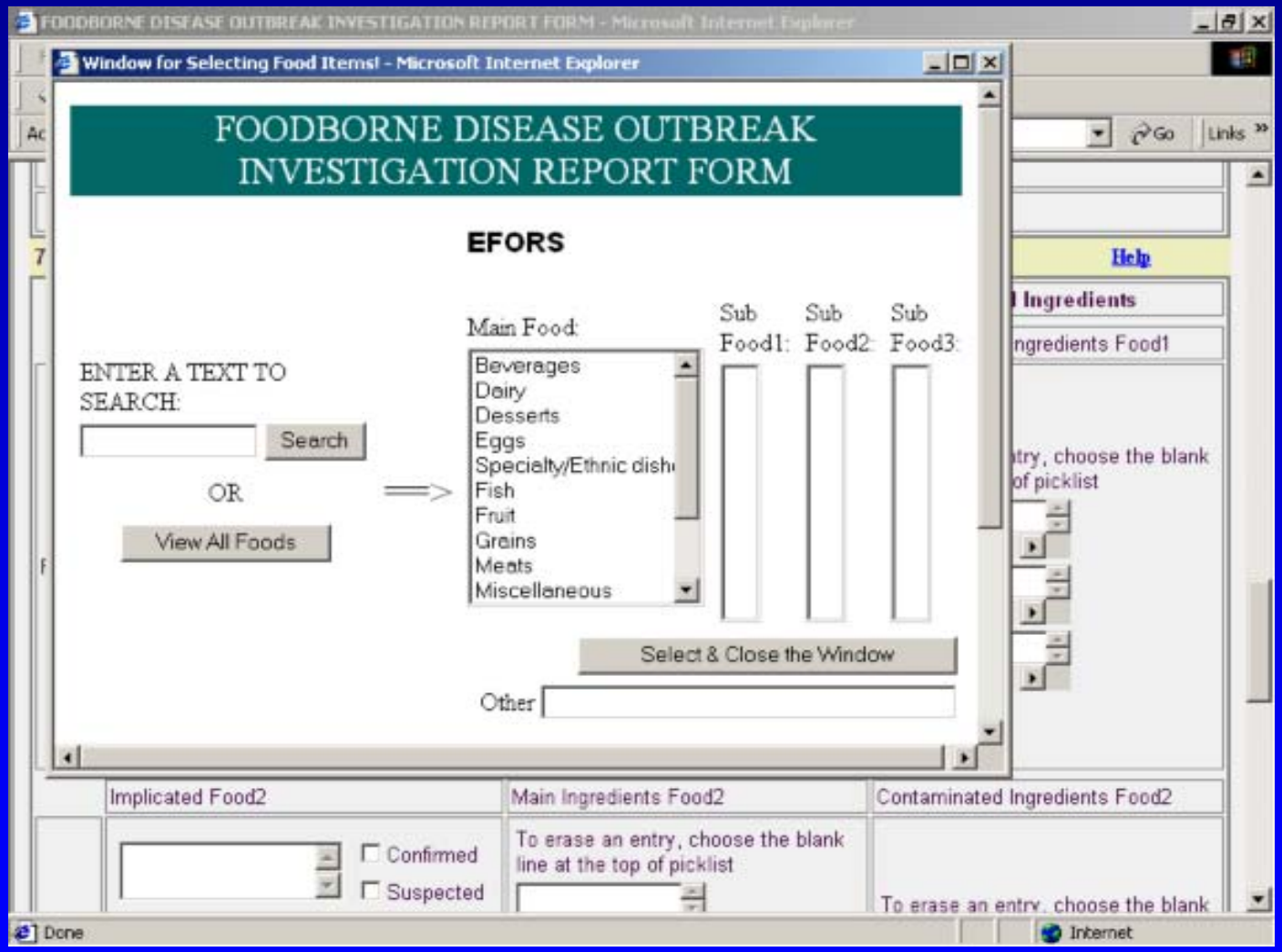

Food Vehicle Module

Electronic Foodborne Outbreak Reporting System (EFORS)

- Investigation methods
  - Epidemiologic investigation
  - Food preparation review
  - Investigation of production plant or farm

- Contributing factors
  - Storage in contaminated environment
  - Inadequate cleaning of equipment
  - Inadequate storage temperature

Environmental Inspection and Testing

Data Sources

- Foodservice establishment inspections
  - Core function of local public health
  - Routine
  - Based on FDA standard model food code
- Water quality testing
  - Contamination
  - Disinfection

Environmental Inspection and Testing

Data Sources

- FDA and USDA food testing
  - Retail food sampling and testing
  - Imported food sampling and testing
  - Plant monitoring
- Industry animal and food testing
  - Quality control programs (HACAP)
  - Specific pathogen control programs

Salmonella Enteritidis (SE) and Eggs

- Retail and Distribution
  - Refrigeration
  - Pooling
- Production
  - Routine environmental testing for SE
  - Egg testing for SE
  - Feed testing for SE
  - Pest control
  - Certified SE-free chicks
  - Biosecurity

Farm to Doctor
Integrated Foodborne Diseases Surveillance

- Pathogen testing at production, processing, retail and patient level with standard subtype analysis
  - Identify sources of pathogens
  - Focus control measures
  - Monitor effectiveness

Farm to Doctor
Integrated Foodborne Diseases Surveillance

- Environmental inspection to identify contributing factors for food contamination
  - Temperature abuse
  - Cross-contamination
  - Environmental contamination
  - Human contamination

Farm to Doctor
Integrated Foodborne Diseases Surveillance

- Tremendous opportunity but many challenges
  - Technical aspects of data integration
  - Standardized methods required for comparisons
  - Data confidentiality and ownership
  - "Self incriminating" for industry
  - Over regulation
  - Funding